Case Report

# Acute Renal Failure Following Ruptured Bladder After Electroresection of a Polyp

*Faissal Tarrass, Khaled Sirajedine, Jean Louis Koenig, Fanny Leroy, Sandrine Nys,[1] Henri Colomb[1]*

Urinary bladder perforation due to electroresection of vesical polyps or cancers is a rare iatrogenic complication. Bladder rupture might cause acute renal failure because of leakage of urine into the peritoneal cavity. We report a case of unexplained renal failure as a consequence of urinary bladder perforation, following the electroresection of a bladder dome polyp. Urinary drainage resulted in rapid resolution of the biochemical abnormalities. Literature on renal failure after urinary bladder rupture is reviewed. [*Hong Kong J Nephrol* 2006;8(1):36–9]

**Key words:** bladder rupture, polyp resection, renal failure, urinary drainage

膀胱穿孔乃膀胱息肉或惡性腫瘤的電切除中罕見的醫源性?發症。基於尿液漏出至腹腔中，膀胱的破裂可能會導致急性腎衰竭。以下是一宗在膀胱半球形息肉的電切除術後，膀胱穿孔所致的原因不明性腎衰竭個案，其生化異常於尿液引流後迅速緩解。本文亦回顧了膀胱破裂後腎衰竭的相關文獻。

## Introduction

Urinary bladder perforation should be in the differential diagnosis of acute oliguric renal failure soon after bladder surgery [1,2]. We present a case of unexplained acute renal failure after electroresection of a bladder polyp. Biochemical features of uremia occurred as a result of intraperitoneal extravasation of urine.

## Case Report

An 81-year-old man was referred to our hospital because of deteriorating renal function shortly after undergoing electroresection of a bladder dome polyp, performed through a transurethral route. Over the ensuing 2 days after the operation, the patient developed oliguria with increasing painless abdominal distension, whilst his serum creatinine rose to 640 μmol/L. The patient's past medical history was marked by type 2 diabetes mellitus and hypertension diagnosed 5 years previously. There was no known history of diabetic ketoacidosis, retinopathy or polyneuropathy.

On physical examination, blood pressure was 140/90 mmHg, with a heart rate of 72 beats/min. His respiratory rate was 20 breaths/min, and he was afebrile. Cardiothoracic examination was unremarkable. Abdominal examination revealed mild distension, with shifting dullness and a large fluid wave. There was no tenderness to deep palpation or organomegaly. Urogenital examination was unremarkable. Digital rectal examination demonstrated a nontender prostate of normal size and contour. Extremities were without edema.

Laboratory investigation revealed an acute rise in his serum creatinine to 640 μmol/L 2 days after surgery, from a baseline value of 120 μmol/L (normal range, 30–115 μmol/L), corresponding to an estimated glomerular filtration rate below 10 mL/min/1.73 $m^2$ by the abbreviated Modification of Diet in Renal Disease (MDRD) study equation. Blood urea was 19 mmol/L, serum sodium was 125 mmol/L, potassium was 4.1 mmol/L, and bicarbonate was 16 mmol/L. Complete blood cell count and coagulation studies were essentially normal. All viral serologies, including hepatitis, were nonreactive. Liver function tests were also within normal limits, including proteins of 71 g/L and serum albumin of 48 g/L.

The patient was admitted to the nephrology service for further diagnostic evaluation and management of

Departments of Hemodialysis and [1]Internal Medicine, Romans General Hospital, Romans sur Isére, France.
**Address correspondence and reprint requests to:** Dr. Faissal Tarrass, Department of Hemodialysis, Romans General Hospital, BP 1002, 26100, Romans sur Isére, France.
E-mail: faissal76@hotmail.com

his acute renal failure. Abdominal ultrasound showed normal-sized kidneys without hydronephrosis, with a large volume of ascitic fluid. Paracentesis yielded approximately 2.6 L of transudative peritoneal fluid, with the following concentrations: glucose, 9 mmol/L; protein, 4 g/L; creatinine, 1,782 μmol/L; urea, 41 mmol/L. Cultures and cytologic examinations were negative. Evaluation of the anesthesia and operation notes did not identify causes for his clinical picture of acute renal failure. In particular, there was no history of profound hypotensive episodes, and use of nephrotoxic medications or intravenous contrast medium.

Despite the absence of hydronephrosis on renal ultrasound, a Foley catheter was placed, yielding 1.5 L of urine output within the first 30 minutes. Although hemodialysis was required initially to correct the patient's azotemia and electrolyte imbalance, his subsequent clinical course was unremarkable, and he was discharged with normal renal function and a serum creatinine level of 100 μmol/L on the third day. Conservative management of the iatrogenic perforation, which consisted of percutaneous drainage of ascites and prolonged Foley catheter drainage of the bladder, was conducted. The patient was discharged from hospital with the Foley catheter *in situ*. Follow-up was performed through weekly cystographic examination. The Foley catheter was removed on the 20th day, after a normal urethrocystography.

## Discussion

This case demonstrates that after bladder surgery, a high degree of suspicion of urinary bladder rupture is warranted in patients with unexplained renal failure and subsequent ascites. The bladder is an extraperitoneal pelvic organ, but has close proximity to the peritoneal cavity, especially over the dome and anterior wall when the bladder is full. Urinary leakage might, therefore, occur intraperitoneally after bladder rupture [2]. In patients with ruptured bladder, renal failure is caused by fluids and electrolytes equilibrating across the peritoneal surface, as occurs in peritoneal dialysis. Serum values of creatinine, urea and potassium will be high, and sodium and chloride concentrations will be low [3–5]. Water and sodium diffuse into the peritoneal cavity to maintain osmolar equilibrium, which emphasizes ascites [4,5].

A review of the medical literature further identified 23 cases of renal failure following bladder rupture (Table) [1,2,4,6–22]. The key diagnostic findings in

**Table.** Reports in the literature of renal failure secondary to urinary bladder rupture

| Author | Year | Age (yr) | Gender | Predisposing condition | Clinical manifestation | Diagnosis and treatment | Timing of resolution |
|---|---|---|---|---|---|---|---|
| Sullivan et al [6] | 1972 | 1 | M | Spontaneous rupture of urinary bladder diverticulum | Anuria with ascites, disproportionate blood urea to creatinine ratio | Cystogram, excision of ruptured diverticulum and cystostomy | 24 hr |
| Sullivan et al [6] | 1972 | 87 | F | Necrotizing cystitis | Acute abdomen, disproportionate blood urea to creatinine ratio | Cystogram | No details |
| Shinotoh et al [7] | 1985 | 38 | M | Alcoholic intoxication and traumatic injury | Hyperkalemic paralysis and gross hematuria | Cystogram, surgical repair | No details |
| Ratliff & Scoble [8] | 1987 | 67 | M | Bladder transitional cell carcinoma with repeated cystodiathermy | Disproportionate rise in serum creatinine | Micturating cystogram and laparotomy bladder repair | No details |
| Davenport & Goldsmith [9] | 1989 | 35 | M | Blunt trauma | Anuria after trauma, lower abdominal and left iliac fossa pain, hyperkalemia and hyponatremia | Cystogram, laparotomy and bladder repair | 24 hr |
| Dees et al [4] | 1990 | 47 | F | Bicycle accident | Painful micturation followed by anuria and distended abdomen | Hemodialysis, bladder catheterization and urine drainage | 4 d |
| Dees et al [4] | 1990 | 50 | F | Bruch operation for urinary incontinence | Abdominal ileus and disproportionate rise in serum creatinine | Excretory urography | No details |
| Dees et al [4] | 1990 | 64 | M | Transurethral resection of bladder polyp | Nausea, lower abdominal pain, and ascites with acute rise in serum creatinine | Retrograde cystography | No details |

| Author | Year | Age (yr) | Gender | Predisposing condition | Clinical manifestation | Diagnosis and treatment | Timing of resolution |
|---|---|---|---|---|---|---|---|
| Jerwood & Mason [10] | 1995 | 37 | F | Trauma and alcoholic intoxication | Generalized peritonitis and hyperkalemic acute renal failure | Laparotomy and bladder repair | 16 hr |
| Kibel et al [11] | 1995 | 28 | F | Normal vaginal delivery | Acute renal failure and ascites 3 days postpartum | Paracentesis, cystography and open bladder repair | No details |
| Tabaru et al [12] | 1996 | 74 | F | Prior stage IIIb uterine cervical cancer treated with external pelvic and intracavitary irradiation | Gross hematuria, lower abdominal pain | Cystoscopy, cystogram and laparotomy bladder repair | 3 d |
| Wystrychowski et al [13] | 1996 | 42 | M | Spontaneous urinary bladder diverticulum perforation | Massive ascites with hyperkalemia and hyponatremia | Removal of ruptured bladder diverticulum | No details |
| Pintar & Wilke [1] | 1998 | 43 | M | No apparent predisposing condition | Moderate ascites with hyperkalemic acute renal failure | Paracentesis, cystography and open bladder repair | No details |
| Stebbing et al [14] | 1999 | 37 | M | No apparent predisposing condition | Acute abdomen and unexplained ascites | Cystography | 3 d |
| Lantsberg et al [15] | 2000 | 42 | F | Total abdominal hysterectomy for uterine fibroid | Unexplained ascites and ileus after gynecologic surgery | Renal DPTA scintigraphy and laparoscopic bladder repair | 3 d |
| Ortega-Carnicer et al [16] | 2000 | 68 | M | Urinary retention from prostate enlargement | Abdominal pain and ascites, hyperkalemic acute renal failure | Exploratory laparotomy | 21 hr |
| Peeters et al [17] | 2001 | 62 | F | Cystectomy and radiotherapy for urinary bladder carcinoma | Relapsing and ascites, hyperkalemic acute renal failure | Exploratory laparoscopy and bladder repair | Self-limiting |
| Jutley & Mason [18] | 2001 | 34 | F | Urinary retention after anticholinergic medication | Abdominal distension and tenderness with acute renal failure, mild hyponatremia, without hyperkalemia | Laparotomy and bladder repair | 11 hr |
| Basavaraj et al [19] | 2001 | 78 | M | Transitional cell carcinoma of urinary bladder with prior radiotherapy | Recurrent acute abdomen with disproportionately elevated urea and creatinine | Cystogram and urine drainage | 48 hr |
| Kruger & Whiteside [20] | 2003 | 19 | F | Diagnostic laparoscopy for dysmenorrhea | Hyperkalemic acute renal failure and peritonitis 3 days after gynecologic surgery | Laparotomy, urine drainage and bladder repair | 36 hr |
| Baseman & Snodgrass [21] | 2003 | 12 | F | Rhabdomyosarcoma of urinary bladder with prior radiotherapy | Abdominal pain and oliguria, with recurrent spontaneous bladder rupture episodes | Computerized cystography, exploratory laparotomy and bladder repair | 24 hr |
| Lynn et al [22] | 2003 | 40 | M | Alcoholic intoxication | Oliguria, ascites and abdominal pain with hyperkalemic acute renal failure | Cystogram, laparotomy and bladder repair | 48 hr |
| Chow et al [2] | 2005 | 50 | F | Total abdominal hysterectomy for uterine fibroid | Unexplained renal failure with acute abdomen and ileus | Cystoscopy, laparotomy and bladder repair | 24 hr |
| This case | 2005 | 81 | M | Resection of a bladder polyp mimicking transitional cell carcinoma | Abdominal distension and tenderness with acute renal failure, mild hyponatremia, without hyperkalemia | Hemodialysis, urine drainage | 3 d |

these cases are renal failure and new onset of ascites. Ultrasound of the abdomen will confirm ascites, but may be misleading in evaluating renal failure. Cystography is the most sensitive technique to demonstrate the site of injury [23,24]. Recently, computed tomography (CT) cystograms have been used in the evaluation of suspected bladder rupture with equally good results. CT images are obtained before and after instillation of contrast material into the bladder per urethra [25].

The management of intraperitoneal bladder rupture has recently become a subject of controversy. Before the 1980s, bladder perforations were managed by laparotomy and open closure. This management decision was based on the high morbidity and mortality associated with bladder perforation. However, it became clear that extraperitoneal perforations can be managed safely with urinary drainage alone [23,26]. Intraperitoneal ruptures continue to be managed by open repair, mostly because of concern about communication between the environment and peritoneal cavity via the catheter and perforated bladder with a high risk of developing peritonitis [27]. Isolated reports presently describe nonoperative management of iatrogenic perforations due to transurethral resection of bladder tumors [27,28]. Muggia et al reported percutaneous drainage of ascites and prolonged Foley catheter drainage of the bladder [28]. However, these reports described small iatrogenic injuries. Large tears caused by blunt trauma clearly should be managed surgically.

In summary, rupture of the urinary bladder may cause acute renal failure and ascites, and should, therefore, be included in the diagnostic algorithms of both disease entities. Nephrologists, who are often the first to encounter such cases, should be aware of this condition. Early recognition and surgical repair, as opposed to dialysis therapy, are warranted in such clinical settings.

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